

**Claims**

1. An electrolytic integrated polishing method for polishing an internal surface of a cylindrical portion of a long sized cylindrical workpiece by integrating elution by electrolyte and abrasion by a grindstone attached to a tool electrode inserted into the cylindrical portion, said method comprising the steps of disposing the long sized cylindrical workpiece so that an axial center of the cylindrical portion is aligned with the vertical direction, inserting the tool electrode attached to the tip of a rotation axis supported downward similarly along the vertical direction into the cylindrical portion, and rotating as well as relatively moving the tool electrode along the vertical direction.

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2. The polishing method for the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to claim 1, wherein the long sized cylindrical workpiece is an aluminum extrusion hollow shape.

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3. The polishing method for the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to claim 1, wherein the long sized cylindrical workpiece is a stainless steel cold-finished tube.

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4. An electrolytic integrated polishing apparatus for polishing

an internal surface of a cylindrical portion of a long sized cylindrical workpiece by integrating elution by electrolyte and abrasion by a grindstone attached to a tool electrode inserted into the cylindrical portion, said apparatus comprising a work supporting unit for disposing the long sized cylindrical workpiece so that the axial center of its cylindrical portion is aligned with the vertical direction, a rotation axis supported downward along the vertical direction and inserted into the cylindrical portion of said long sized cylindrical workpiece, a tool electrode attached to the tip of the rotation axis, and a transportation unit for moving said rotation axis and/or the work supporting unit along the axial direction.

5. An electrolytic integrated polishing apparatus for polishing an internal surface of a cylindrical portion of a long sized cylindrical workpiece by integrating elution by electrolyte and abrasion by a grindstone attached to a tool electrode inserted into the cylindrical portion, said apparatus comprising a work supporting unit for disposing the long sized cylindrical workpiece so that the axial center of its cylindrical portion is aligned with the vertical direction, a rotation axis inserted into the cylindrical portion of said long sized cylindrical workpiece, a coaxial external tube supported downward along the vertical direction to free-rotatably support said rotation axis and inserted together with said rotation axis into the cylindrical portion of said long sized cylindrical workpiece, a tool electrode

attached to the tip of said rotation axis, and a transportation unit for moving said rotation axis and/or the work supporting unit along the axial direction.

5 6. The electrolytic integrated polishing apparatus for polishing the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to claim 5, wherein a plastic tube, inside of which can be pressurized, is spirally wound around the peripheral of said external tube.

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7. The electrolytic integrated polishing apparatus for polishing the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to any one of claims 4 to 6, wherein a free ring, having approximately the same bore as a  
15 finished bore of said cylindrical portion, is free-rotatably disposed to the upper and the lower positions of the cylindrical portion of the long sized cylindrical workpiece.

8. The electrolytic integrated polishing apparatus for polishing  
20 the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to claim 6, wherein a free ring, having approximately the same bore as the finished bore of said cylindrical portion, is free-rotatably disposed to the upper and the lower positions of the cylindrical portion of the long sized  
25 cylindrical workpiece, and a restricting sleeve with a predetermined length, having approximately the same bore as the

bore of said free ring, is disposed further above the free ring disposed at the upper side.

9. The electrolytic integrated polishing apparatus for polishing  
5 the internal surface of the cylindrical portion of a long sized cylindrical workpiece according to any one of claims 4 to 8, wherein a hollow portion is provided inside the tool electrode, and a plastic tube, inside of which can be pressurized, is provided in said hollow portion.

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10. A long sized cylindrical workpiece, with the length of a cylindrical portion thereof being ten times as large as a diameter thereof, or more, finished by the electrolytic integrated polishing to have a roundness of an internal surface of the  
15 cylindrical portion equal to or smaller than  $10\mu\text{m}$  and a surface roughness  $R_{\text{max}}$  equal to or smaller than  $1\mu\text{m}$ .